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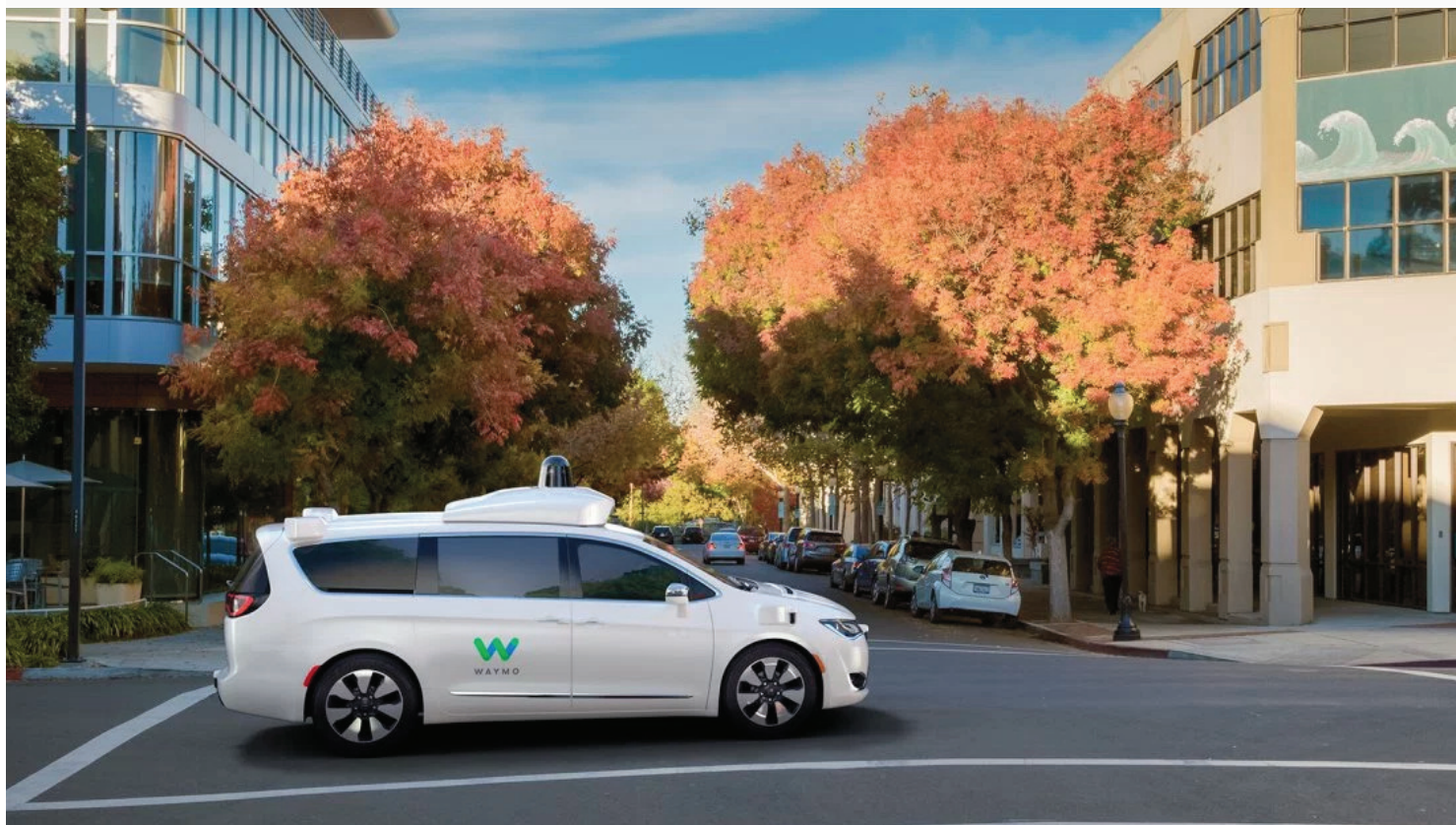
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Courtesy of Waymo

WAYMO



Self-Driving Car Company: Waymo

Kirsten Korosec

Jan 08, 2017



John Krafcik, the CEO of Waymo—the Google self-driving project that recently spun out to become a business under Alphabet—made it abundantly clear Sunday just how serious the company is about bringing autonomous vehicles to market.

A day before the North American International Auto Show kicked off in Detroit, Krafcik provided more than just a first look at its self-driving Chrysler Pacifica minivan. The company technically took the wraps off its autonomous minivans in December. But this is the first time Waymo is providing details about its business model, the technology inside the vehicle, and its timeline for testing on public roads.

These are the five biggest takeaways from Krafcik's keynote.

WAYMO IS MANUFACTURING ALL OF THE HARDWARE FOR ITS SELF-DRIVING SYSTEM

This is more than notable. It's the most important news to come out of Krafcik's keynote. The company is manufacturing the entire suite of sensors on its self-driving cars, which includes the vision system, radars, and light detection and ranging radar known as LiDAR.

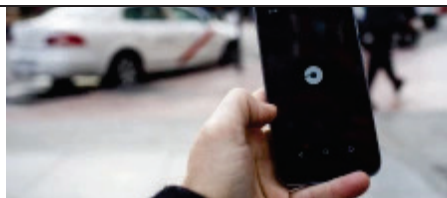
It's not just unusual; it's unprecedented.

"It was the eminently-quotable computer scientist Alan Kay who said, 'people who are really serious about software should make their own hardware.' And later on companies like Apple and Google with its Pixel phones took it as their mantra to create technology that would change the way we work and how we connect," Krafcik said. "Well at Waymo, we're serious about creating fully self-driving cars that can help millions of people. And to do that we have to oversee both the self-driving software and the self-driving hardware."

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The company is shooting for Level 4 autonomy, a designation by the SAE that means the car takes over all of the driving in certain conditions. For example, it could drive fully autonomously in a certain geographic location such as a specific route in city center, or only in certain weather conditions.

Waymo's move is a departure from automakers and other tech companies that are racing to deploy autonomous cars. Instead of partnering with a number of other companies—something automakers have been doing—Waymo believes



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Krafcik said its new vision system, which is designed to take and read a high resolution picture of the world, can handle more complex situations. Waymo's system has vision modules using multiple sensors, and an additional forward-facing super high resolution multi-sensor module that provides a 360-degree view. This allows the system to detect small objects, even in the dark or in harsh sunlight or glare.

Waymo also produced a new radar system that has a continuous 360-degree view, so it can track objects and vehicles usually hidden from the human eye, Krafcik said.

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WAYMO DEVELOPED TWO NEW CATEGORIES OF LIDAR

LiDAR measures distance using laser light to generate highly accurate 3D map of the world around the car. Waymo's team of engineers developed two new categories of LiDAR: a short range and a long range LiDAR.

This is a rate of redundancy that is unmatched in the industry right now.

WAYMO HAS SLASHED THE COST OF SELF-DRIVING TECH

The company's self-driving cars are equipped with cameras, radars, and LiDAR. LiDAR is expensive; it's one of the most costly components of self-driving vehicles. It's one reason why many believe self-driving cars will too expensive for individual consumers and will instead be launched as a service long before they're available for purchase.

A single top-of-the-range LiDAR costs more than \$75,000, according to Waymo. Companies like Velodyne, which the Google self-driving project used until 2012, have been working on lowering the cost and size of the technology.

Waymo's engineers have brought the cost of LiDAR down by more than 90%. Krafcik says the company plans to push those costs even lower as it looks to scale its business.

"This is critical as we look to commercialize self-driving technology," Krafcik said.

WAYMO HAS MADE A FOUR-FOLD IMPROVEMENT ON ITS SELF-DRIVING SOFTWARE

In 2015, the company's test drivers disengaged—a jargon term that means they had to take manual control of the vehicle because the software failed or for safety reasons—at a [rate of 0.8 times per 1,000 miles](#) in California.

The rate in California has fallen, even as the company increases its test miles, to 0.2 disengages per thousand. Waymo didn't provide data on disengagements in other states like Arizona or Washington where it tests self-driving cars. Any company issued a testing permit from the California DMV must submit an annual report detailing disengagements.

SELF-DRIVING MINIVANS WILL BE ON PUBLIC ROADS BY THE END OF JANUARY

The minivans will be in Arizona and California by the end of the month, Krafcik said.

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Waymo is adding 100 of these self-driving minivans to its fleet, as part of a collaboration announced in May with Fiat Chrysler Automobiles—the first time the tech company has worked directly with an automaker to create its autonomous vehicles.

Krafcik has said he sees [Waymo's self-driving car](#) technology being used in an array of applications from personal vehicles and ride-sharing to logistics and solving so-called last-mile problems for public transport.

companies described this as a technical collaboration that would allow both companies to learn about how to best integrate Waymo's self-driving sensors, software, and computing platform into Honda vehicles.

Honda could provide Waymo with vehicles that have been modified to accommodate its self-driving technology. These vehicles would join Waymo's existing fleet, which has test vehicles in Mountain View, Calif., Chandler, Ariz., Austin, and Kirkland, Wash.



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